IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
TEXARKANA DIVISION

HITACHI MAXELL, LTD., *Plaintiff*, v. HUAWEI DEVICE USA INC. and HUAWEI DEVICE CO., LTD., *Defendants*.	Case No. 5:16-cv-00178-RWS LEAD CASE **JURY TRIAL DEMANDED**
HITACHI MAXELL, LTD., *Plaintiff*, v. ZTE CORPORATION and ZTE USA INC., *Defendants*.	Case No. 5:16-cv-00179-RWS **JURY TRIAL DEMANDED**

DECLARATION OF BARMAK MANSOORIAN, Ph.D., IN SUPPORT OF DEFENDANTS' RESPONSIVE CLAIM CONSTRUCTION BRIEF

1. I, Barmak Mansoorian, do declare as follows:

2. I have been retained by counsel for ZTE (USA) to provide this declaration in support of the Defendant's Responsive Claim Construction relating to certain claim terms in U.S. Patent No. 8,339,493 titled "ELECTRIC CAMERA" (the "'493 Patent) and U.S. Patent No. 8,736,729 titled "ELECTRIC CAMERA" (the "'729 Patent"). If called as a witness, I could and would testify competently to the matters set forth herein.

3. My opinions are based on my years of education, research and experience, as well as my investigation and study of relevant materials. The materials that I studied for this declaration include all exhibits of the petition.

I. BACKGROUND AND QUALIFICATIONS

4. Attached hereto as Exhibit A is a true and correct copy of my curriculum vitae. I have summarized by educational background, work experience, and relevant qualifications in this section.

5. I am the founder and president of Forza Silicon Corporation and one of the world's leading experts in CMOS image sensors.

6. I have been involved in image sensor design for over 20 years as scientist, product developer, entrepreneur and mentor. My focus was in mixed-signal integrated circuit design, semiconductor device physics and device micro-fabrication with specialization in active pixel sensors (APS), infrared focal plane array technology and high-speed communication. I have summarized in this section my educational background, work experience, and other relevant qualifications

7. I received my Bachelor of Science degree and Master of Science degree in Electrical Engineering from University of California, San Diego in 1988 and 1990 respectively. In 1994, I received my Ph.D. degree in Applied Physics from University of California, San Diego. My dissertation was on on-chip optical interconnections using Lead Lanthanum Zirconium Titanate material.

8. After receiving my Ph.D. degree in 1994, I worked at Jet Propulsion Laboratory for one year as a member of technical staff. I was responsible for the development of large format APS sensors. This work resulted in a 1Kx1K pixel sensor with on-chip analog-to-digital

converters – at the time the highest resolution image sensor with integrated ADC and digital interface.

9. While at Jet Propulsion Laboratory, I also worked on research on APS imagers also led to the development of CMOS image sensor arrays with a record low noise performance that was not improved upon by the industry until 2003.

10. While at Jet Propulsion Laboratory, I was the recipient of the NASA Group Achievement Award, along with the Active Pixel Image Sensor team.

11. From 1995 to 1999, I worked at Photobit Corporation as senior scientist and director of technical marketing. I was responsible for new image sensor product development, technical interface with customers and fabrication facilities, and business development in Japan and Korea.

12. While at Photobit Corporation, I was the lead designer responsible for a series of high resolution, high-speed image sensors that, successively, held the resolution/speed performance records for CMOS image sensors.

13. While at Photobit Corporation, I was also responsible for the development of a very high dynamic range image sensor capable of "moonlight to sunlight" imaging (0.01 lux to 20000 lux) targeted for security and machine vision applications.

14. From 1999-2001, I worked at Optical Micro Machines Corporation as director of hardware engineering. I was responsible for the development of electronics hardware for MEM's based optical switches. I managed the design of 96-channel, 300 volt, 14-bit amplifier IC's and the activities of 20+ engineers in designing the components for switch network products.

15. In 2001, I started Forza Silicon Corporation. The corporation is fully dedicated to the development of high-performance mixed-signal integrated circuits for imaging and high speed communication.

16. I hold 21 patents in image sensor design and have contributed to 12 articles in imaging and high-speed communication.

17. A complete list of publication is provided in my curriculum vitae, which is attached as Appendix A.

II. LEVEL OF ORDINARY SKILL IN THE ART

18. In rendering the opinions set forth in this declaration, I was asked to consider the patent claims and the prior art through the eyes of a person of ordinary skill in the art. I considered factors such as the educational level and years of experience of those working in the pertinent art; the types of problems encountered in the art; the teachings of the prior art; patents and publications of other persons or companies; and the sophistication of the technology. I understand that a person ordinary skill in the art is not a specific real individual, but rather a hypothetical individual having the qualities reflected by the factors discussed above.

19. In my opinion, a person ordinary skill in the art, at the time of the '493 patent, would have been aware of electric camera generating still and moving images using different operating modes. Such person ordinary skill in the art would have a Bachelor's Degree in Electrical Engineering, Computer Engineering and/or Computer Science with 3 years industry experience working with imaging systems. Extensive experience and technical training may substitute for educational requirements, while advanced education such as a relevant MS or PhD might substitute for experience.

III. MATERIAL CONSIDERED

20. I have considered the following information in forming my opinions:

a. The '729 Patent;

b. The '493 Patent;

c. The Prosecution History of the '729 Patent;

d. The Prosecution History of the '493 Patent;

e. P.R. 4-3 Joint Claim Construction and Prehearing Statement (dated Aug. 31, 2017)

f. Plaintiff's Opening Claim Construction Brief (dated Oct. 2, 2017); and

g. Declaration Of Dr. Vijay Madisetti in Support of Plaintiff's Opening Claim Construction Brief (dated Oct. 2, 2017).

IV. UNDERSTANDING OF THE LAW

21. I understand that the claims of a patent are presumed to be valid, and that invalidity of a claim must be proven by clear and convincing evidence.

A. Claim Construction

22. I understand that the claims of the patent define the limits of the patentees' exclusive rights. In order to determine the scope of the claimed invention, courts typically construe (or define) claim terms, the meaning of which the parties dispute. My purpose in submitting this declaration is to assist the Court in its construction of the disputed claims based upon how a person of ordinary skill in the art at the time the patent applications were filed would have understood those claims.

23. I understand that claim terms should generally be given their plain and ordinary meaning as understood by one of ordinary skill in the art at the time of the invention and after reading the patent and its prosecution history. Claims must be construed, however, in light of and consistent with the patent's intrinsic evidence. Intrinsic evidence includes the claims themselves, the written disclosure in the specification, and the patent's prosecution history,

including the prior art that was considered by the United States Patent and Trademark Office ("PTO").

24. The language of the claims helps guide the construction of claim terms. The context in which a term is used in the claims can be highly instructive.

25. The specification of the patent is the best guide to the meaning of a disputed claim term. Embodiments disclosed in the specification help teach and enable those of skill in the art to make and use the invention, and are helpful to understanding the meaning of claim terms. For example, an inventor may attribute special meanings to a term by specifically defining it or otherwise incorporating such a definition in the specification or file history. However, limitations should not be imported from the specification into the claims.

26. In the specification, a patentee may also define his own terms, give a claim term a different meaning than it would otherwise possess, or disclaim or disavow claim scope. A claim term is generally presumed to possess its ordinary meaning. This presumption, however, does not arise when the patentee acts as his own lexicographer by explicitly defining or re-defining a claim term. This presumption can also be overcome by statements, in the specification or prosecution history of the patent, of clear disclaimer or disavowal of a particular claim scope.

27. I understand that the specification may also resolve any ambiguity where the plain and ordinary meaning of a claim term lacks sufficient clarity to permit the scope of the claim to be ascertained from the claim words alone.

28. I understand that the prosecution history is another important source of evidence in the claim construction analysis. The prosecution history is the record of the proceedings before the PTO, including communications between the patentee and the PTO regarding the patent application. The prosecution history can inform the meaning of the claim language by

demonstrating how the patentee and the PTO understood the invention and whether the patentee limited the invention in the course of prosecution, making the claim scope narrower than it would otherwise be. I understand that a patentee may also define a term during the prosecution of the patent. The patentee is precluded from recapturing through claim construction specific meanings or claim scope clearly and unambiguously disclaimed or disavowed during prosecution.

29. I understand that extrinsic evidence may also be considered when construing claims. Extrinsic evidence is any evidence that is extrinsic to the patent itself and its prosecution history. Examples of extrinsic evidence are technical dictionaries, treatises, and expert testimony. I understand that extrinsic evidence is less significant than the intrinsic record in determining the meaning of the claim language. I understand that extrinsic evidence can be useful to provide background on the technology at issue, to explain how an invention works, to ensure that the understanding of the technical aspects of a patent is consistent with that of a person of ordinary skill in the art, or to establish that a particular term in the patent or prior art has a particular meaning in the art.

B. Indefiniteness claims under § 112, ¶ 2

30. I understand that a claim limitation is indefinite if the claim, when read in light of the specification and the prosecution history, fails to inform with reasonable certainty persons of ordinary skill in the art about the scope of the invention at the time the patent application was filed.

31. I understand that the claim language might mean several different things, but even if a definition is supported by the specification, the claim is still indefinite if a person skill in the art cannot translate the definition into a precise claim scope.

32. I understand that the definiteness requirement mandates clarity but recognizes that absolute precision is impossible.

C. "Means-plus-function" claims under § 112, ¶ 6

33. I understand that claim terms may be written in a means-plus-function format. I understand that use of the word "means" followed by a recited function creates a presumption that the claim limitation is in means-plus-function format. I understand that the presumption that a claim limitation is a means-plus-function limitation can be rebutted by showing either (1) the claim phrase sufficiently recites a definite structure for performing the function; or (2) "means" claim language exists without recitation of a function.

34. I understand that although the statute refers to the words "means for," those words are not required for a term to be subject to § 112, ¶ 6. The absence of these words in the claims of a patent creates a rebuttable presumption that § 112, ¶ 6 does not apply. However, such presumption can be overcome if the claim term fails to recite sufficiently definite structure or recites function for performing that function. The words of the claim must be understood by person skill in the art to have definite meaning as the name for structure.

35. I understand that, where there is no corresponding structure for a means-plus-function claim limitation disclosed in the specification of a patent, that claim limitation is indefinite. I understand that the absence of structure from the patent's specification cannot be cured by resorting to the knowledge of a person of ordinary skill in the art.

36. I understand that for means-plus-function limitations that are performed on a computer, the simple disclosure of a general purpose computer is not sufficient structure to render the claim limitation definite. Rather, a patent claim that includes a computer-implemented means-plus-function limitation must disclose an algorithm for performing the claimed function; in the absence of a disclosed algorithm for performing the claimed function,

the claim limitation is indefinite. Because general purpose computers can be programmed to accomplish a function in multiple ways, merely disclosing a general purpose computer does not provide a sufficient limit on the scope of the claim when a means-plus-function limitation is used. The corresponding structure for a computer-implemented means-plus-function limitation is not a general purpose computer, but rather an algorithm that turns the general purpose computer into special-purpose computer or microprocessor that is programmed to perform the claimed function. I understand that the claimed limitation will be indefinite if the specification does not disclose an algorithm in sufficient detail for performing the claimed function.

V. BACKGROUND OF THE ‘493 AND ‘729 PATENTS

37. While there are no terms disputed in the ’493 patent, it shares a common specification with the ’729 patent. That shared specification describes the inventions embodied in the claims of both the ’493 patent and the ’729 patent. The patents are directed to cameras with image sensors, image processors, and displays. In the various embodiments contained in the patents, the image processors are configured with algorithms for fixed image and video formation. The image sensors contain a grid of filters and associated charge elements which make up the pixels. See FIGs 4, 10, 13A, and 13B, See also 4:43 – 4:48; 6:18 – 6:30; 12:57 – 12:59; and 15:24 – 15:45. The processing algorithms disclosed involve the formation of still imagery as well as video.

VI. OPINIONS ON CLAIM CONSTRUCTION

38. There are no disputed terms from the ’493 Patent, but both the ’493 and ’729 Patents share a specification and are directed to the same subject matter.

A. “*an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern*”

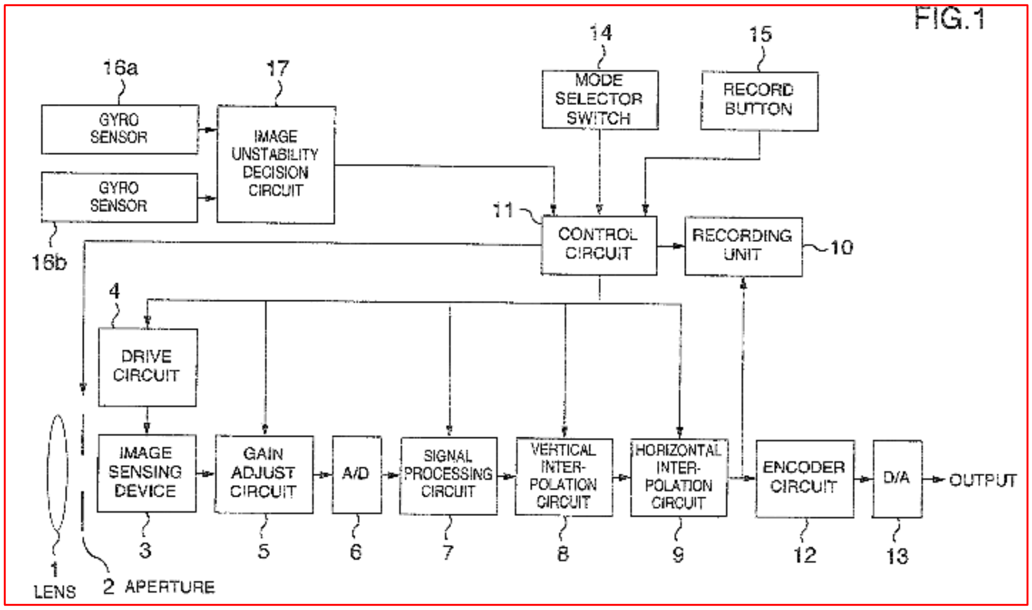
Defendant’s Proposed Construction	Plaintiff’s Proposed Construction

This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, 6. Function: “for image sensing” Structure: a solid state image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern and having an equal number of color sensitive filter elements arranged such that each color forms a vertical line. *See* “a solid-state image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern, in an N number of vertically arranged pixel lines” (2:59) *See also* FIGs 10, 13A, and 13B; [6:17-22]; [15:23-35]	Plain and ordinary meaning

39. In my opinion, this phrase is a means-plus-function limitation because it does not connote sufficiently definite structure to one of skill in the art. In addition, a person skill in the art reading the specification would not be able to identify any corresponding structure for the function of image sensing.

40. The ’493 patent and’729 patent share the same specification and all of the independent claims in the ‘493 patent have the term as “a solid-state image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern, in an N number of vertically arranged pixel lines.” In my opinion, Defendant’s proposed construction is consistent with the patent language, that the structure for the ‘729 term should remain the same given since the same specification is used and there is no reason given for changing the term.

41. As stated in the specification, in FIG.1, light coming from the lens 1 through the aperture 2 is focused on a light receiving surface of the image sensing device 3 where it is converted into an electric signal.



42. Plaintiff's expert Dr. Madisetti states that the term alone denotes a definite structure or class of structure and that a person ordinary in the skill would understand. Dr. Madisetti shows FIG. 2 and FIG. 10 as image sensing device and opine that the written description of the '729 patent demonstrates that the "image sensing device" term denotes sufficiently that the patent explains that, in one embodiment, the "image sensing device … is of a CCD [charge-coupled device] type."

43. However, Dr. Madisetti fails to note that the structure for image sensing must include the color sensitive filters. As stated in Dr. Madisetti's declaration that in one embodiment, the image sensing device is of a CCD [charge-coupled device] type, but even CCD type uses filters to filter red, blue and green colors.

44. As specified in the specification, the pixels are arranged in grid like manner, and each includes a filter capable of passing Yellow, Green, and Cyan. The filters are arranged in columns of like color and the set of the three colors is repeated horizontally for every three pixels and the filters of the same color are vertically lined.

45. Furthermore, as the example shown in FIG. 13A and B, the color filters are arranged in vertical stripes, the R, G, B, primary color signals can be generated from one line of output signals at all time no matter how many pixels are vertically combined.

FIG.13A

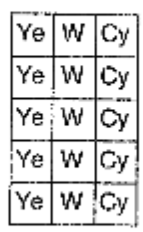
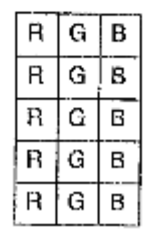


FIG.13B



B. ***"an image instability detector"***

Defendant's Proposed Construction	Plaintiff's Proposed Construction
Indefinite This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. Function: "detecting an image-instability of the electric camera" Structure: insufficient corresponding structure disclosed	"a device, such as a gyroscopic sensor or the like, capable of detecting an image instability of the electric camera"

46. In my opinion, this phrase is a means-plus-function limitation because it does not connote sufficiently definite structure to one of skill in the art. In addition, a person skill in the

art reading the specification would not be able to identify any corresponding structure for detecting an image-instability of the electric camera.

47. To prevent unwanted movement, a camera stabilizer device, a tripod, that holds a camera in place or anti-shake feature that allows user to shoot images at slower shutter speeds, are well known in the field of image processing.

48. Image stabilization is also known by many different names, for example, Optical Image Stabilization (OIS), Electronic Image Stabilization (EIS), Vibration Reduction (VR), Anti-Shake, and Steady Shot.

49. For example, there are two main types of Anti-Shake systems: lens based or camera based. Lens based anti-shake uses a moving optical element to counteract shaking. Camera based anti-shake uses a mechanism which allows the image sensor to move to compensate for unwanted movement. Once the image is taken, data is fixed to the time and place.

50. Additionally, the specification of the patent fails to teach any definite structure for detecting an image-instability of the electric camera. The specification states that to use gyro sensors to detect vertical image-unstability and lateral image-unstability, however, it fails to show how the unstability is detected and measured.

C. "*an amount of image-instability of the camera*"

Defendant's Proposed Construction	Plaintiff's Proposed Construction
Indefinite	"an amount of instability caused by vertical and/or horizontal movement of the electric camera"

51. I understand that a claim limitation is indefinite if the claim, when read in light of the specification and the prosecution history, fails to inform with reasonable certainty persons of

ordinary skill in the art about the scope of the invention at the time the patent application was filed.

52. I understand that the claim language might mean several different things, but even if a definition is supported by the specification, the claim is still indefinite if a person skill in the art cannot translate the definition into a precise claim scope.

53. In my opinion, the term is indefinite because person skill in the art cannot translate the definition into a precise claim scope. The term "an amount of image-instability of the camera" could mean the affected pixel areas, the quality of the image in part or in whole, or the overall look and feel of the image as a whole.

54. Dr. Madisetti suggests that the term "an amount of image-instability of the camera" refers to the vertical and horizontal movement of the camera that causes instability in a generated image, however, this is only one of the possible explanation of the terms. When read in light of the specification and the prosecution history, the term could have multiple meanings as discussed above.

55. Dr. Madisetti also states that A person of ordinary skill would recognize that gyro sensors may be used to measure orientation, in this case, the relative movement of the camera. Gyroscopes are devices that measure the angular rotational velocity. Gyroscopes can measure rotational velocity in 1, 2, or 3 directions. 3-axis gyroscopes are often implemented with a 3-axis accelerometer to provide a full 6 degree-of-freedom (DoF) motion tracking system. However, the specification did not point to any specific relationship between vertical and horizontal movement and the claimed images instability.

D. "*a display unit configured to display an image corresponding to the image signals formed by the signal processing unit*"

Defendant's Proposed Construction	Plaintiff's Proposed Construction

This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, 6. <u>Function</u>: “for displaying an image corresponding to the image signals formed by the signal processing unit” <u>Structure</u>: “display screen of a television system” (3:22-23) or other screen compatible with NTSC or PAL format (1:35–36; 10:19–21)	Plain and ordinary meaning

56. In my opinion, this phrase is a means-plus-function limitation because it does not connote sufficiently definite structure to one of skill in the art. In addition, a person skill in the art reading the specification would not be able to identify any corresponding structure for displaying an image corresponding to the image signals formed by the signal processing unit.”

57. One of ordinary skill in the art would not understand the term “a display unit configured,” standing alone, to provide sufficiently definite structure, because much like a generic term, “a display unit” is merely a construct that is often used by person skill in the art that is equivalent to the word “means.” The term “a display unit” is generic that could be anything from a television display, cell phone display, to a computer monitor. Thus, a person skill in the art would not understand that the patentees intended to use “a display unit” in this same generic sense.

58. I agree with Defendant’s proposed structure because “display screen of a television system” or other screen compatible with NTSC or PAL format is consistent with the patent language.

59. Display screen of a television system is frequently used throughout the specification. When displaying videos, the specification states that the camera is capable of produce output signals compatible with NTSC and PAL television systems.

60. The specification gives an example of the NTSC system that it performs interlaced scanning on two fields, each of which has an effective scanning line number of about 240 lines. The specification further discusses that other than NTSC, PAL standard of television can also be used to display video output signals.

61. Thus, in my opinion, this phrase is a means-plus-function limitation that it does not connote sufficiently definite structure to one of skill in the art and defendant's proposed structure is accurate and consistent with the patent specification.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct to the best of my knowledge and that this declaration was executed on October 23, 2017.

Barmak Mansoorian

Executed: October 23, 2017

APPENDIX A

Barmak Mansoorian, Ph.D.

President/Co-Founder at Forza Silicon Corporation
barmak@forzasilicon.com, (858) 349-3132
4950 Indianola Way, La Canada Flintridge, CA. 91011

Personal Profile: I have had the great pleasure of being involved in image sensor design for over 20 years as scientist, product developer, entrepreneur and mentor.

Work Experience:

2001 - Present: President, Forza Silicon Corporation
Started Forza Silicon in 2001 to be fully dedicated to the development of high-performance mixed-signal integrated circuits for imaging and high speed communication.
Our success has reflected a continued emphasis on innovation and problem-solving. We partner with customers and foundries in the pursuit of highly practical first-of-a-kind designs, and we complement this work with full turnkey production services where needed.
Our mission statement is to Solve our customer's’ most demanding imaging problems by understanding their needs and creating the strongest silicon solutions using the state-of-the-art in mixed-signal design, physics, and computation.

1999 - 2001: Director of Hardware Engineering, Optical Micro Machines Corp
Responsible for the development of electronics hardware for MEMs based optical switches:
- Managed the design of 96-channel, 300 volt, 14-bit amplifier IC's
- Managed the activities of 20+ engineers in designing the components for switch network products.

1995 - 1999: Senior Scientist/Director of Technical Marketing, Photobit Corp.
Responsible for new image sensor product development, technical interface with customers and fabrication facilities, and business development in Japan and Korea. Lead designer responsible for a series of high resolution, high-speed image sensors that, successively, held the resolution/speed performance records for CMOS image sensors. Responsible for the development of a very high dynamic range image sensor capable of “moonlight to sunlight” imaging (0.01 lux to 20000 lux) targeted for security and machine vision applications.

1994 - 1995: Member of Technical Staff, NASA’s Jet Propulsion Lab
Responsible for the development of large format CMOS image sensors. This work resulted in a 1Kx1K pixel sensor with on-chip analog-to-digital converters – at the time the highest resolution image sensor with integrated ADC and digital interface.
Research on CMOS imagers also led to the development of CMOS image sensor arrays with a record low noise performance that was not improved upon by the industry until 2003.
Recipient of the NASA Group Achievement Award, along with the Active Pixel Image Sensor team.

Selected List of Publications:

- "133Mpixel 60fps CMOS image sensor with 32-column shared high-speed column-parallel SAR ADCs", 2015 IEEE International Solid-State Circuits Conference
- "BSI Low Light Level CMOS Image Sensor Employing P-type Pixel", 2013 International Image Sensor Workshop
- "Single Slope ADC and On-chip Accelerated Continuous-time Differential Ramp Generator for Low Noise Column Parallel CMOS Image Sensor", 2013 International Image Sensor Workshop
- "Design of Analog Readout Circuitry with Front-end Multiplexing for Column Parallel Image Sensors", 2013 International Image Sensor Workshop
- "RF Design Issues and Challenges in a CMOS Image Sensor Process", 2013 International Image Sensor Workshop
- "Design of a PTC-Inspired Segmented ADC for High Speed Column Parallel CMOS Image Sensor" 2011 International Image Sensor Workshop
- "A 4-side tileable back illuminated 3D-integrated Mpixel CMOS image sensor", 2009 IEEE International Solid-State Circuits Conference
- "A 2.5 inch, 33Mpixel, 60 fps CMOS Image Sensor for UDTV Application", 2009 International Image Sensor Workshop
- "A 250 mW, 60 frames/s 1280x720 pixel 9 b CMOS digital image sensor", 1999 IEEE International Solid-State Circuits Conference
- "A high speed, 500 frames/s, 1024x1024 CMOS active pixel sensor" 1999 Symposium on VLSI circuits
- "A Low-Light to Sunlight, 60 Frames/s, 80k Pixel CMOS APS Camera-on-a Chip with 8b Digital Output", 1999 IEEE Workshop on Charge-Coupled Devices and Advanced Image Sensors
- "A Single Chip CMOS APS Digital Camera", 1997 IEEE Workshop on Charge-Coupled Devices

Patents:

PAT. NO.	Title
9,357,149	Stitched image sensor with multiple part drivers
9,019,139	Analog to digital converter with built-in data compression based on shot noise of image sensor
8,816,892	Segmented column-parallel analog-to-digital converter
7,821,557	High speed sampling of signals in active pixel sensors using buffer circuitry
7,667,752	Semiconductor imaging sensor array devices with dual-port digital readout
7,635,833	Electronic neutral density filter
7,630,011	High-speed sampling of signals in active pixel sensors
7,501,631	Shielding an imaging array from X-ray noise
7,245,321	Readout circuit with gain and analog-to-digital conversion for image sensor
7,119,839	High resolution CMOS circuit using a matched impedance output transmission line
6,944,352	Circuitry for determining median of image portions
6,885,396	Readout circuit with gain and analog-to-digital a conversion for image sensor
6,870,565	Semiconductor imaging sensor array devices with dual-port digital readout
6,606,122	Single chip camera active pixel sensor
6,546,148	Circuitry for determining median of image portions
6,480,921	Reducing internal bus speed in a bus system without reducing readout rate
6,473,124	RAM line storage for fixed pattern noise correction
6,452,528	Double comparison successive approximation method and apparatus
6,400,824	Semiconductor imaging sensor with on-chip encryption
6,194,696	Active pixel sensor with current mode readout
6,043,690	Bidirectional follower for driving a capacitive load

Education:

Ph.D., Applied Physics, University of California San Diego 1994
MS, Electrical Engineering, University of California San Diego 1990
BS, Electrical Engineering, University of California San Diego 1990